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Study of continuous ultrasonication to improve total phenolic content and antioxidant activity in sorghum flour and its comparison with batch ultrasonication

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Ultrasonic technology was applied to release the phenolics bound with starch and protein matrix in order to enhance total phenolic content (TPC) and antioxidant activity (AA) of sorghum flour. Both continuous and batch ultrasonication were implied with independent variables such as flour to water ratio (FWR), ultrasonication intensity (UI), and ultrasonication time (UT) with an additional variable as flow rate (FR) in continuous ultrasonication. All the process variables showed a significant effect on the corresponding ultrasonication process. The Box–Behnken Design provided satisfactory mathematical models which accurately explain the behavior of both the systems; allowing predicting TPC and AA of the sorghum flour. The optimal conditions for continuous ultrasonication were a FWR of 10% w/v, an UI of 20 W/cm2, a FR of 15 ml/s, and 130 s UT which predicted a maximum value of 70.88 mg GAE/100g dry matter (d. m.) for TPC and 143.98µmol TE/100g d. m. for AA. Regarding batch ultrasonication, the maximum predicted values were 65.61 mg GAE/100g d. m. and 141.04µmol TE/100g d. m. for TPC and AA, respectively at optimum conditions of 10% w/v FWR, 30 W/cm2 UI, and 200s UT. When comparing with batch ultrasonication, continuous process saved 35% time and 33 % of energy consumption to obtain comparatively higher TPC and AA of sorghum flour. Ultrasonication improved the free phenolic acid content by releasing the bound phenolics in sorghum flour.

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Effect of grinding action on the flow ability of rice flour

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Rice (*Oryza sativa* L.) is an important food crop in the world. Broken rice, either basmati or non-basmati rice varieties, is used to produce rice flour by milling. The effect of grinding action on the flowability of rice flour was evaluated using flow indicators viz., bulk density, aerated bulk density, angle of repose, frictional co-efficient, Carr's index and Hausner's ratio; and powder flow analysis viz., cohesive index, caking strength and powder flow stability. Fine rice flours ground in cyclotec mill were more cohesive and coarse flour (basmati rice flour) ground in super mill was free-flowing. Flours ground using hammer mill was highly irregular in particle shape than the other flours, thus was found less flowable than flours milled in stone mill, despite of being larger in size.

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